

these two more or less general cold waves and also for limited areas on the 8th, 13th, 24th, and 25th.

Warnings for frost and freezing temperature were issued for portions of the east Gulf and South Atlantic States on 12 days during the month. While these warnings included extreme northern Florida eight times, the only forecast of frost for central Florida was that of the 1st. Bartow reported light frost on the morning of the 2d, the only frost during the month in that section. The atmospheric pressure remained relatively high over the Florida Peninsula and over the ocean to the eastward throughout the period of advance of the two widespread cold waves from the Northwest. Consequently, no damaging temperature was experienced in the Florida Peninsula.—*C. L. Mitchell.*

CHICAGO FORECAST DISTRICT

The monthly mean temperature was far below the seasonal normal over practically the entire forecast district. The greatest departures were -12.3° at Duluth, Minn., and -11.6° at Havre, Mont., and the smallest departure was -2.6° at Cairo, Ill.

The precipitation was below the monthly normal over the Upper Lake region, but in nearly all other sections it was above, and markedly so in the lower Ohio and lower Missouri Valleys.

Cold-wave warnings.—Although the average monthly temperature was very low, the weather was, nevertheless, fairly mild during the first half, and the cold waves during that period were local and fleeting. It was not until the night of the 14th that the front of the first cold wave, which had moved southeastward from Alaska, reached Alberta. This steadily increased in energy, with not only falling temperature but increasing atmospheric pressure. The full force of the cold wave was not felt to the eastern limits of the district until the 19th and 20th. The pressure exceeded the December record at several stations in the district, and the cold was more severe than any previously experienced in December for many years. Warnings were issued well in advance of the fall in temperature, and all interests throughout the district notified.

The cold continued in most sections until near the close of the month, aside from temporary relief on two or three days. There was marked redevelopment in the Northwest on the 26th, and in consequence, additional cold-wave warnings were necessary for the eastern portion of the forecast district.

Livestock warnings.—Warnings were issued on the 14th of the month to livestock interests in Montana, the Dakotas, Wyoming, and Nebraska. Additional messages were sent to the southern portion of this area on December 15 and 16, and on the 17th the warnings were extended into Kansas, so that the cattle interests had advice well in advance of the great cold wave and strong northerly winds which accompanied it.

Storm warnings.—Storm warnings were issued for the Great Lakes during the month from time to time, when occasion demanded, until the close of regular navigation on the 16th. The principal storm occurred on the 13th, due to the rapid deepening of a depression in Ontario and the development of a high in Manitoba. On the morning of the 12th a forecast for "fresh to strong winds with rain or snow" was made for the Upper Lakes and "fresh winds" for the Lower Lakes, and in the evening northwest storm warnings were ordered on Lake Superior, it being thought that warnings might be issued on the morning of the 13th sufficiently early for the rest of the region. However, by daybreak the storm was

being felt in full force over Lake Michigan, and later in the day over Lake Huron and the Lower Lakes. Storm warnings were then, of course, flying at all Lake stations, although, obviously, too late to be of any service on Lakes Michigan and Huron. However, because of the lateness of the season, most of the vessels had made their last trip and had reached winter quarters: and, fortunately, so far as known, no losses were sustained.

Special attention was given to the shippers of perishable goods in all directions during the extreme winter conditions, as a part of the regular advisory service maintained for the benefit of fruit shippers in the north Pacific States. Messages were sent to three exchanges every Monday morning, covering, as far as practicable, the temperature conditions for the ensuing week for the northwestern portion of the Chicago district. These advices had, for the most part, a high degree of verification, and it is believed that no loss whatever was sustained by these shippers.—*H. J. Cox.*

NEW ORLEANS FORECAST DISTRICT

After the first week, areas of high pressure were dominant and in some instances were attended by severe cold.

Cold-wave warnings were issued during the afternoon of the 3d for the northwestern portion of the district except the northern portion of West Texas. Temperatures below freezing occurred on the morning of the 5th but were not low enough to verify the cold-wave warnings. In this instance the principal crest of the area of high pressure moved eastward, and the western extension following the low diminished in intensity.

A cold-wave warning was issued for parts of central and southwestern Texas on the ninth, after the receipt of special observations, but failed of verification, conditions proving to be less intense than was expected, with cloudy weather ensuing.

Warnings were issued well in advance of a slow moving but severe cold wave which reached the northwestern portion of the district on the 17th and extended to the Texas coast on the 19th and to the Louisiana coast on the 20th. The area of high pressure in this instance was unusually large and was preceded by a well-defined area of low pressure which moved slowly southward over the Rocky Mountain region and the Southwestern States. The cold wave was attended by considerable snow and sleet, with glaze in some localities. Stockmen received early advices of the severe conditions. Temperatures of 24° to 30° were predicted on two successive days for the lower Rio Grande Valley and temperatures occurred as forecast, with a minimum of 26° at Brownsville, Tex.

While temperatures were still low in most sections of the district a large northwestern high and a southwestern low attained marked development on the 23d and a cold wave occurred as the high moved southward, reaching the Texas coast Christmas eve and extending to the southeastern coast of Louisiana during the night of the 24th-25th. Timely cold-wave and temperature warnings and warnings for stockmen were issued.

Cold-wave and livestock warnings were issued for the district, except the southwestern portion of West Texas, in timely advance of a large area of high pressure, which moved southeastward from Alberta on the 26th-27th; but after reaching the lower Missouri Valley, the crest of the area of high pressure moved eastward. Freezing temperatures did not reach the coast, but there was a cold wave as forecast for the interior sections of the district, with temperatures below zero in central Oklahoma and zero to 14° above in Arkansas.

On the morning of the 31st, a large area of high pressure, crested near Winnipeg, Manitoba, occupied the northern half of the country and pressure was low over the upper Rio Grande Valley. Cold-wave warnings were issued for Arkansas and were extended, on special observations, over southern Oklahoma, the northern and western portions of East Texas, and the southeastern portion of West Texas. The warning was generally verified. A cold wave occurred also in the northern portion of West Texas, for which special temperature and livestock warnings had been issued, the temperatures predicted being only slightly higher than the temperatures that occurred.

Northwest storm warnings were issued for the Texas coast at 3 p. m. on the 9th. Northerly winds, closely approximating the verifying velocity occurred.

Warnings for the norther that reached the Texas coast on the 19th were issued at 8.40 p. m. on the 18th and were extended the next morning along the Louisiana coast. For similar conditions on the 24th, northwest storm warnings were issued for the Texas coast at 9 p. m. of the 23d and small-craft warnings were displayed on the Louisiana coast the next morning. Small-craft warnings were displayed also on the Texas coast on the 3d and 29th.

Warnings for northerly gales at Tampico, Mexico, were issued on the 19th and 24th.

In addition to the cold-wave warnings, frost or freezing temperature warnings, mostly for the coast sections, were issued on the 1st, 8th, 9th, 10th, 11th, 21st, 25th, 26th, 27th, and 28th; these warnings were generally verified.—*R. A. Dyke.*

DENVER FORECAST DISTRICT

The month was cold and stormy, with frequent disturbances advancing southeastward across the district, followed by HIGHS of remarkable intensity. The most notable storm moved southeastward from eastern Washington during the 15th, taking the place of an area of high pressure that had occupied the Plateau region for about a week, while another HIGH of unusual strength covered the northeastern Rocky Mountain slope. The low decreased rapidly in intensity during the 17th and reached New Mexico on the night of that date. The area of high pressure overspread the entire Rocky Mountain region by the 19th, with its crest over western Wyoming, where the pressure increased to more than 31.2 inches, and temperatures below zero extended to southern Colorado and north-central Arizona on the morning of that date.

Warnings of cold waves were issued as conditions seemed to require on the dates and for the States and parts of States as shown in the exhibit below. These warnings were generally verified.

Cold-wave warnings, Denver district, December, 1924

Dates	Character of cold wave	Places
Dec. 6.....	Moderate.....	Arizona (except extreme southwest portion), Colorado, Utah (eastern and southern).
15.....	do.....	Colorado (eastern and central).
16.....	Severe.....	Colorado (eastern and central), northeast and extreme southeast New Mexico.
16.....	Moderate.....	Extreme west Colorado, northwest New Mexico, north-east Arizona, and Utah.
17.....	do.....	West Colorado, north New Mexico, east Utah.
17.....	Severe.....	New Mexico.
18.....	do.....	West Colorado and north New Mexico.
23.....	Moderate.....	West Colorado, north and west New Mexico, east Arizona, and south Utah.
26.....	Severe (?).....	Colorado (east and central).
27.....	do. (?).....	Colorado (east), and New Mexico (northeast).
30.....	Moderate.....	Colorado (northeast and southeast), Utah (southwest).
31.....	do.....	Colorado (west), New Mexico (north and extreme east), Arizona (east), Utah (southeast).

Livestock warnings were issued on the 6th for Colorado, Arizona, except the extreme southwest portion, and Utah; on the 23d for western Colorado, northern and western New Mexico, eastern Arizona and southern Utah; on the 30th for eastern Colorado and southwestern Utah. The warnings were generally justified, except those for southern Arizona on the 6th.

The followings warnings of frost and freezing temperature were issued for southern Arizona: 3d, 4th, 7th, 9th, 10th, 11th, 17th, 20th, and 21st, frost south-central and southeast portions; 18th and 31st, frost south, freezing temperature south-central and southeast portions; 19th, freezing temperature south-central, frost extreme southwest portions; 23d, 26th, and 29th, frost south portion; 24th, 25th, and 27th, frost extreme southwest, freezing temperature south-central and southeast portions. These warnings were generally verified.—*J. M. Sherier.*

SAN FRANCISCO FORECAST DISTRICT

Abnormal weather conditions prevailed in the San Francisco forecast district during the month of December, 1924. Marked changes occurred in rapid succession, especially from the 8th to the 26th, inclusive. To understand the cause of this period of extraordinary weather, it is necessary to examine daily graphs of both pressure and temperature at stations in Alaska and at Honolulu. A study of these will disclose the fact that there was a constantly falling pressure at Honolulu from the 5th to a minimum on the 15th, and a gradual rise thereafter until the close of the month. There was a rise to above normal pressure over Bering Sea at the end of November, and the pressure continued above normal over that area until the 25th. Over Alaska proper the pressure was normal during the first 10 days of the month, decidedly above normal from the 11th until the 27th, and below normal thereafter. The peaks of highest pressure, which approximated 31 inches, occurred at most Alaska stations on the 14th and 15th and again on the 20th and 21st, over British Columbia on the 23d, and over Idaho on the 25th. The graphs of temperature show a decided change to lower temperatures at Alaska stations to a minimum for the month between the 11th and 15th. This polar air made its appearance over British Columbia on the 15th and moved thence southward, enveloping the whole Pacific slope during the following 48 hours. Temperatures continued decidedly below normal thereafter on the Pacific slope until after the 27th, when a marked rise overspread this region.

The following special forecasts and warnings were issued during the month: (a) On the 5th, for heavy snows in the Sierra Nevada during the next 24 hours; (b) on the 15th, livestock warnings were issued for eastern Washington, eastern Oregon, Idaho, and Nevada for snow, strong north winds, and much colder for the next two or three days; and (c) cold-wave warnings issued for the same section for temperatures much below freezing during the next 36 hours, and for freezing temperatures in northern and central California in 48 hours; (d) cold-wave warnings were issued on the 16th, in eastern Oregon, southern Idaho and Nevada for temperatures of zero or below in the next 36 hours; and (e) warnings in the citrus belt of southern California for much lower temperature for the next three days, when firing would be necessary; (f) on the 19th, special warnings in California, also given to the press associations, for increasing cloudiness with rising temperature probably followed by rain in California and snow turning to rain in Washington and Oregon in the next 24 to 36 hours; (g) on the 26th, a warning for unsettled